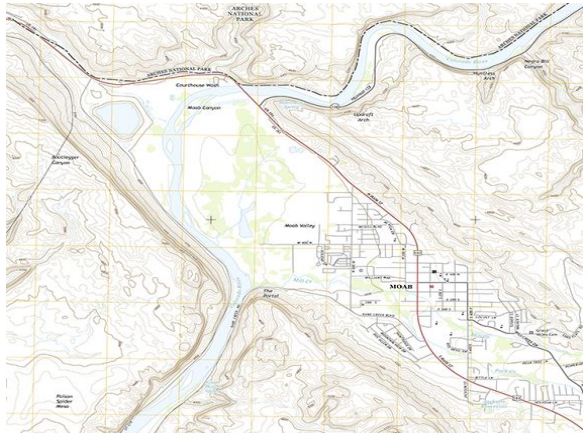
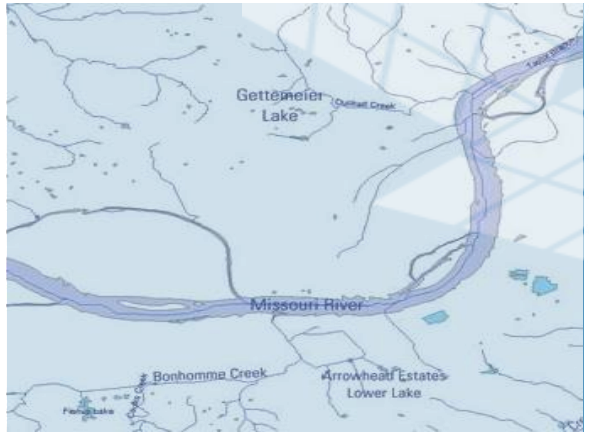
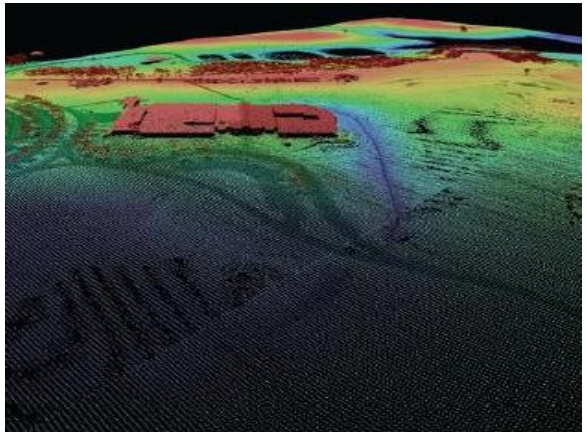
The 3D Elevation Program Update for NGAC







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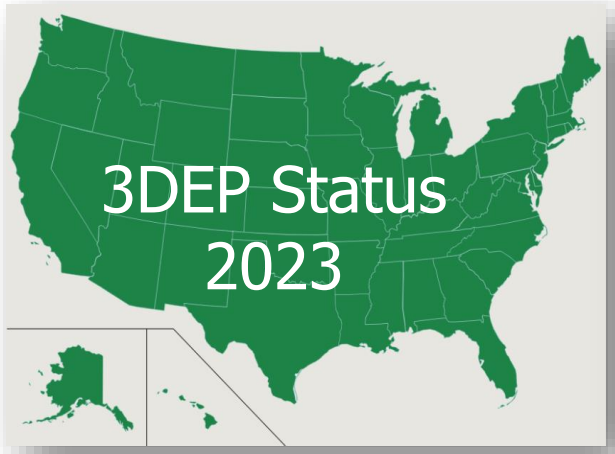
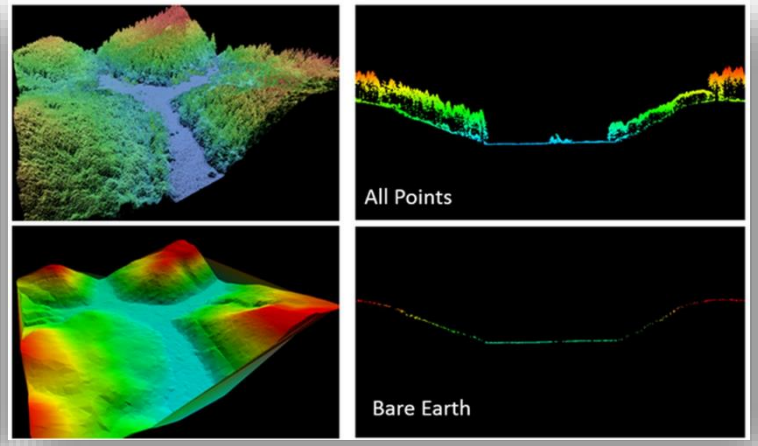
Vicki Lukas
Chief, Topographic Data Services
National Geospatial Program
April 28, 2021

3D Elevation Program (3DEP) Goal

- Complete acquisition of nationwide lidar (IfSAR in AK) by 2023 to provide the **first-ever national baseline of consistent high-resolution elevation data – both bare earth and 3D point clouds – collected in a timeframe of less than a decade**
- Address Federal, state and other mission-critical requirements
- Realize ROI 5:1 and potential to generate $13 billion/year
- Leverage the expertise and capacity of private mapping firms
- Achieve a 25% cost efficiency gain
- Completely refresh national data holdings





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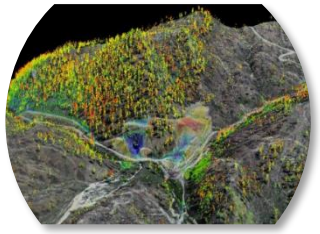
		Annual Benefits	
Rank	Business Use	Conservative	Potential
1	Flood Risk Management	$295M	$502M
2	Infrastructure and Construction Management	$206M	$942M
3	Natural Resources Conservation	$159M	$335M
4	Agriculture and Precision Farming	$122M	$2,011M
5	Water Supply and Quality	$85M	$156M
6	Wildfire Management, Planning and Response	$76M	$159M
7	Geologic Resource Assessment and Hazard Mitigation	$52M	$1,067M
8	Forest Resources Management	$44M	$62M
9	River and Stream Resource Management	$38M	$87M
10	Aviation Navigation and Safety	$35M	$56M
:			
20	Land Navigation and Safety	$0.2M	$7,125M
	Total for all Business Uses (1 – 27)	**$1.2B**	**$13B**

Foundational Data Underpin Administration Priorities

3D Elevation Program Supports…

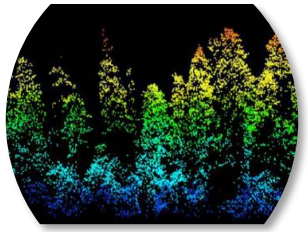
Climate Science

Flood forecast and response



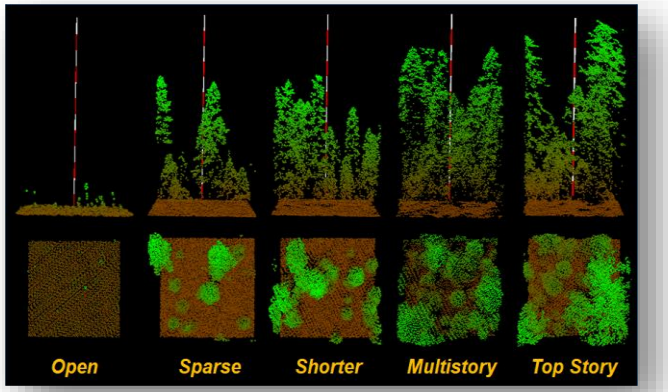
Wildfire management

Sea-level rise modeling



Habitat management

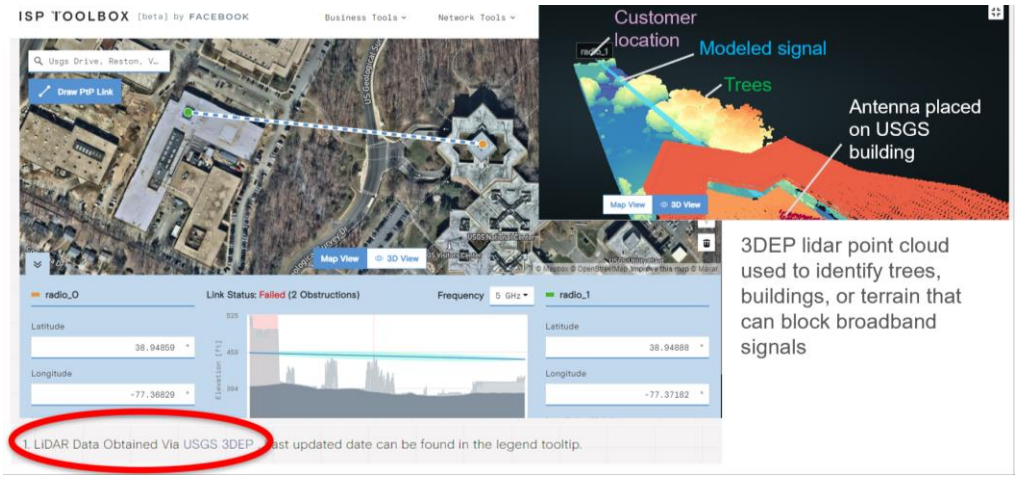
Conservation



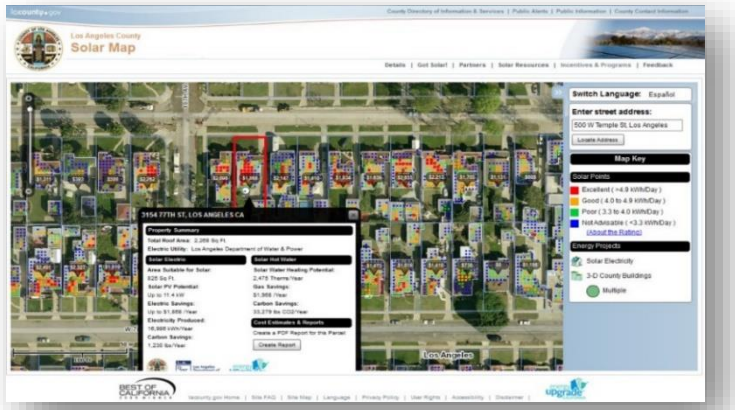
Economy

MAPPS

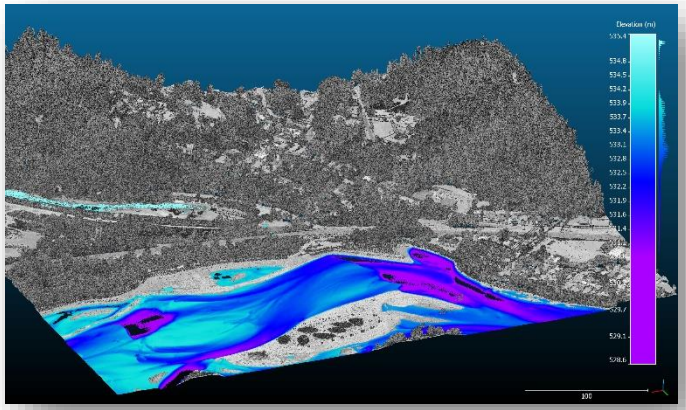
Racial and Economic Equity



Clean Energy Deployment



Tribal Programs



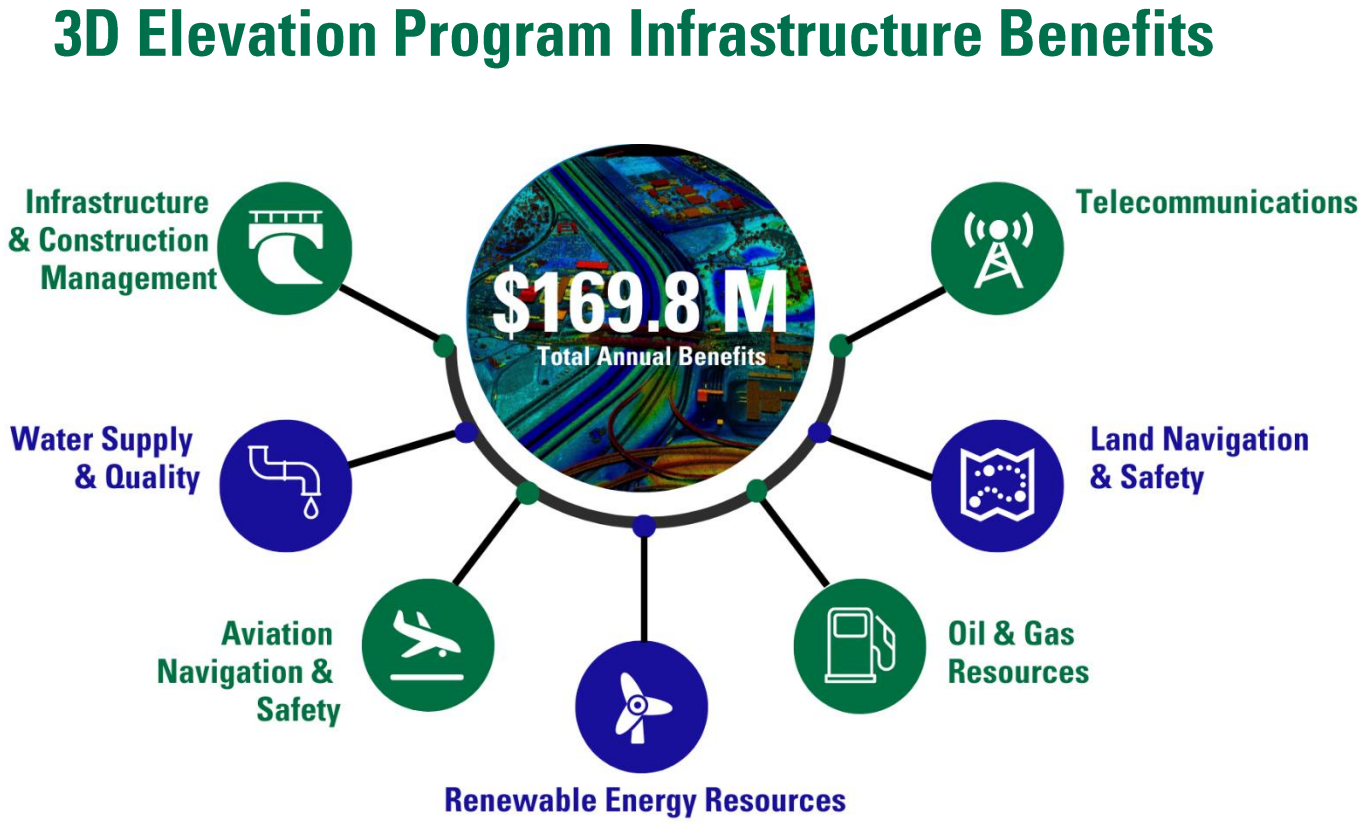
Klamath, Kootenai, and Nisqually Tribes: bathymetric lidar data for fish habitat restoration

Foundational Data Underpin Administration Priorities

3D Elevation Program Supports…

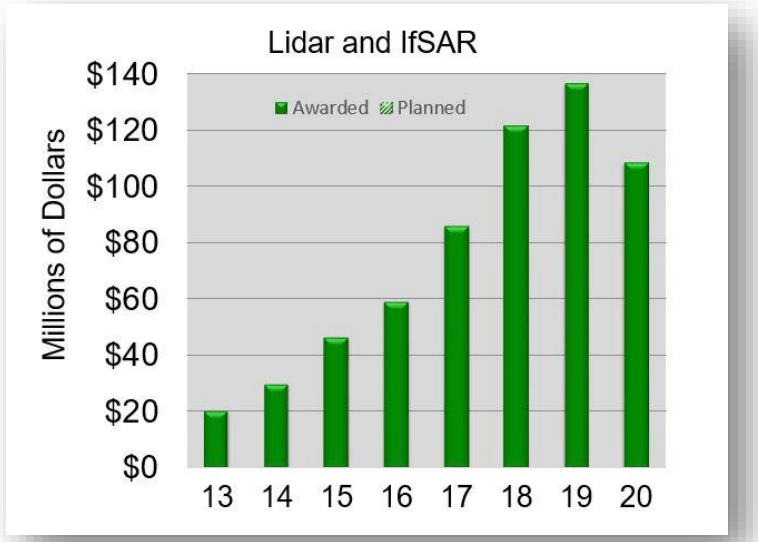
Infrastructure

- 3DEP, NHD, and geophysical data are foundational and directly applicable to a broad range of infrastructure applications
- Data acquired have a high ROI for infrastructure as well as a broad range of other applications
- Data are acquired by the private sector, creating jobs
- Data programs are “shovel ready”
- The Federal and industry capacity exist to execute and deliver
- Data acquisition is easily accounted for and auditable
- No new O&M tail is required
- We have shown success before with ARRA – a proven process

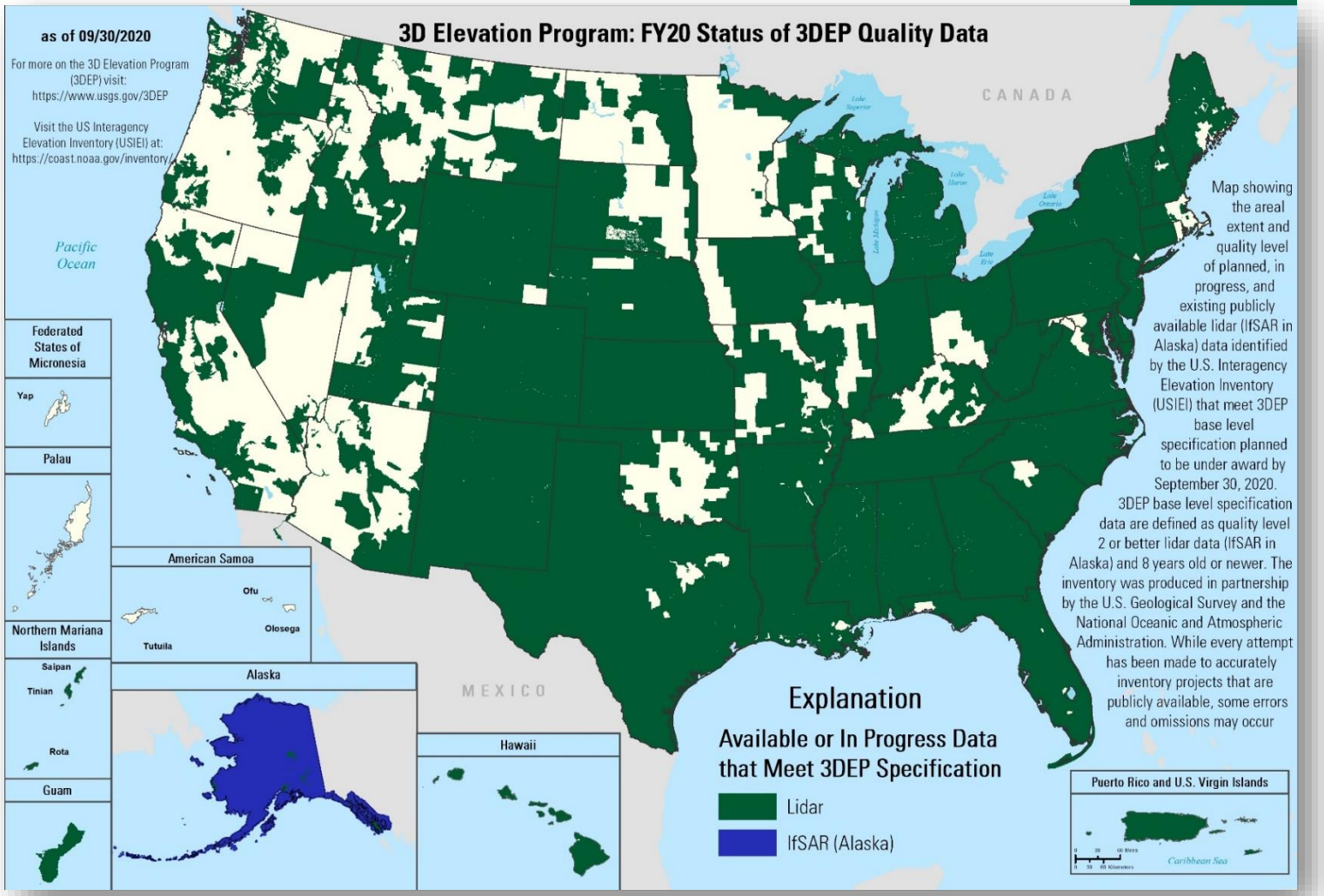


3DEP FY20 Summary

Data are available or in progress for ~78% of the Nation
*includes lidar and AK IfSAR



Data acquisition investments by all partners, by fiscal year



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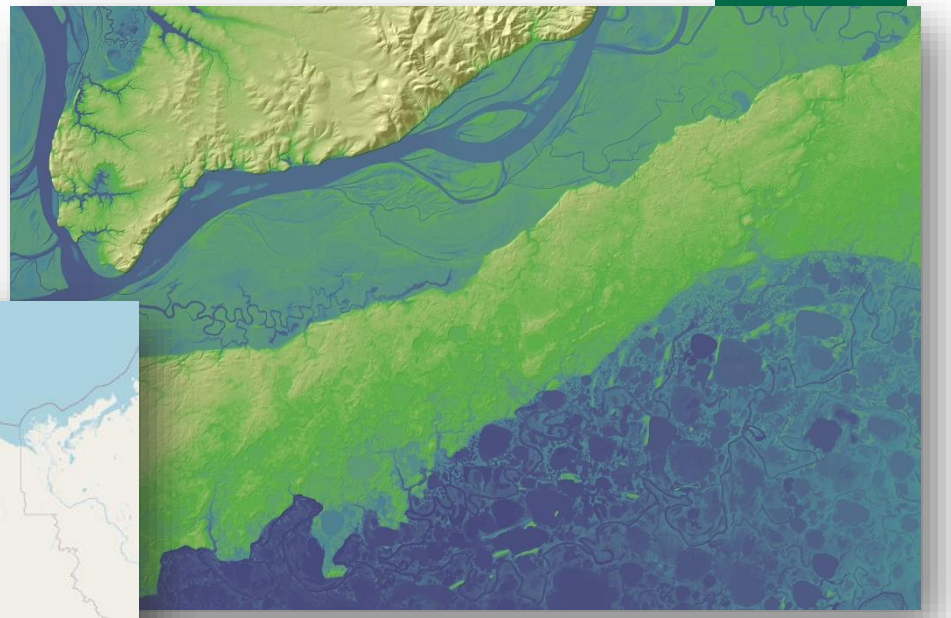
Statewide Completion

Alaska IfSAR

- 100% of the State is complete
- Data available for download on The National Map and the state of Alaska elevation portal



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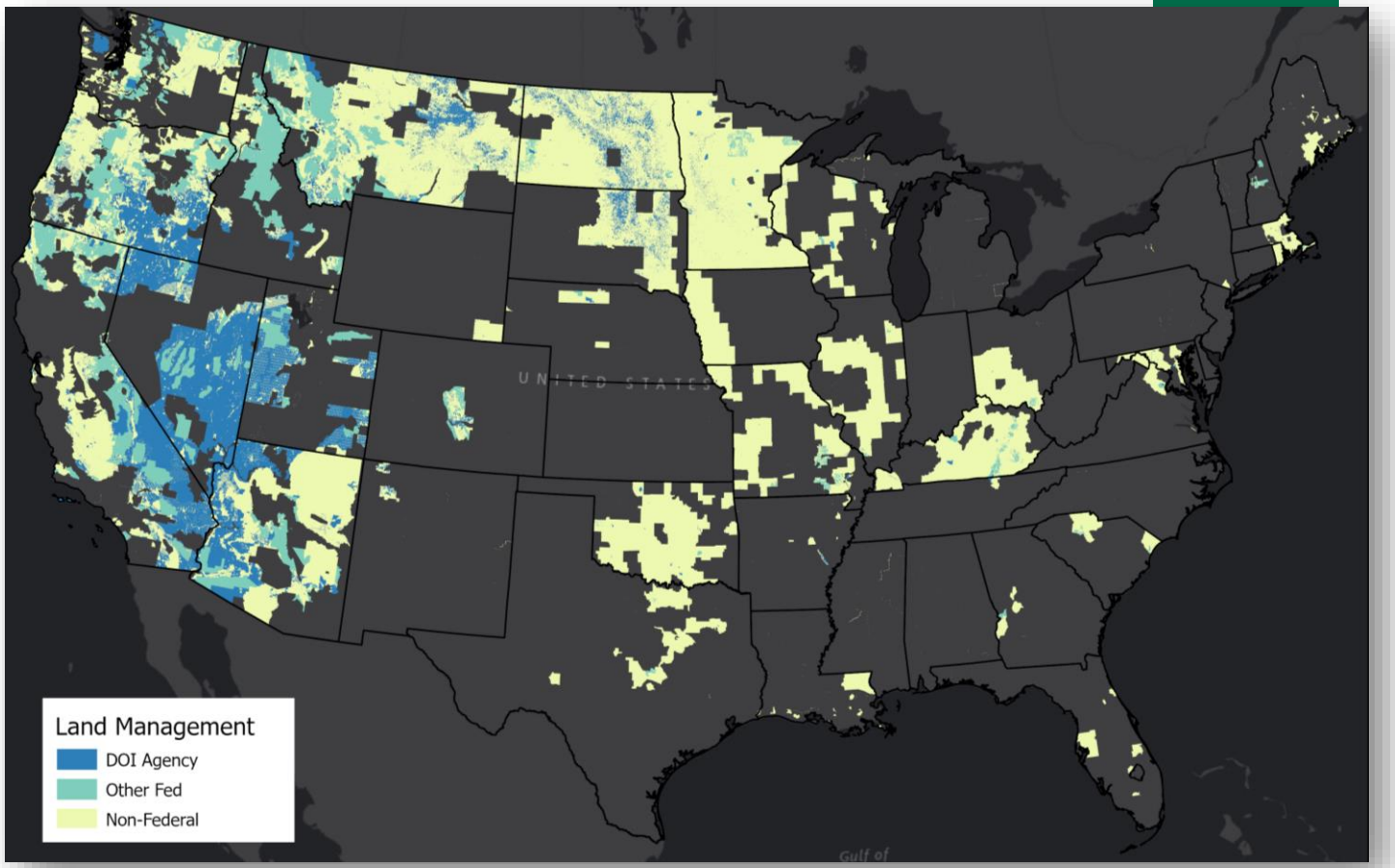
Remaining Areas

End of FY20

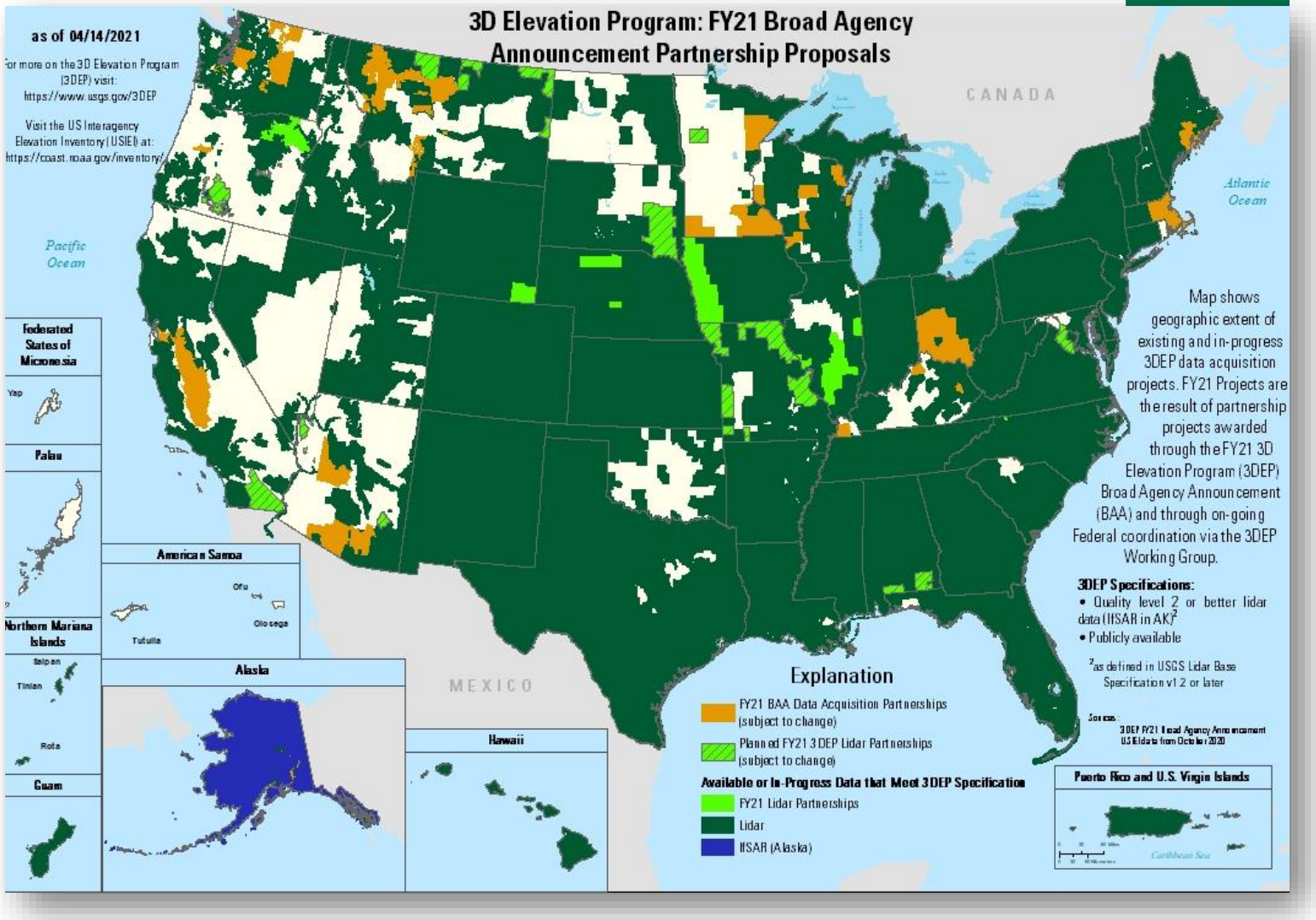
Data Acquisition	Cost to Complete	Area (sq. mi.)	% of cost	% of remaining area
DOI	**$67.4M**	**195,395**	**23%**	**22%**
Other Fed	$54.4M	124,996	19%	14%
Non-Federal	$171.5M	555,069	59%	63%
Total	**$293.2M**	**875,460**	**100%**	**100%**



3DEP FY21 Partnerships

Status (as of 4/14)

- Completed FY21 Broad Agency Announcement proposals
  - Received 27 proposals in 14 states
  - Accepted 18, shown in **orange**
- Working with Federal partners to develop acquisition plan for remaining funding, shown in **bright green**



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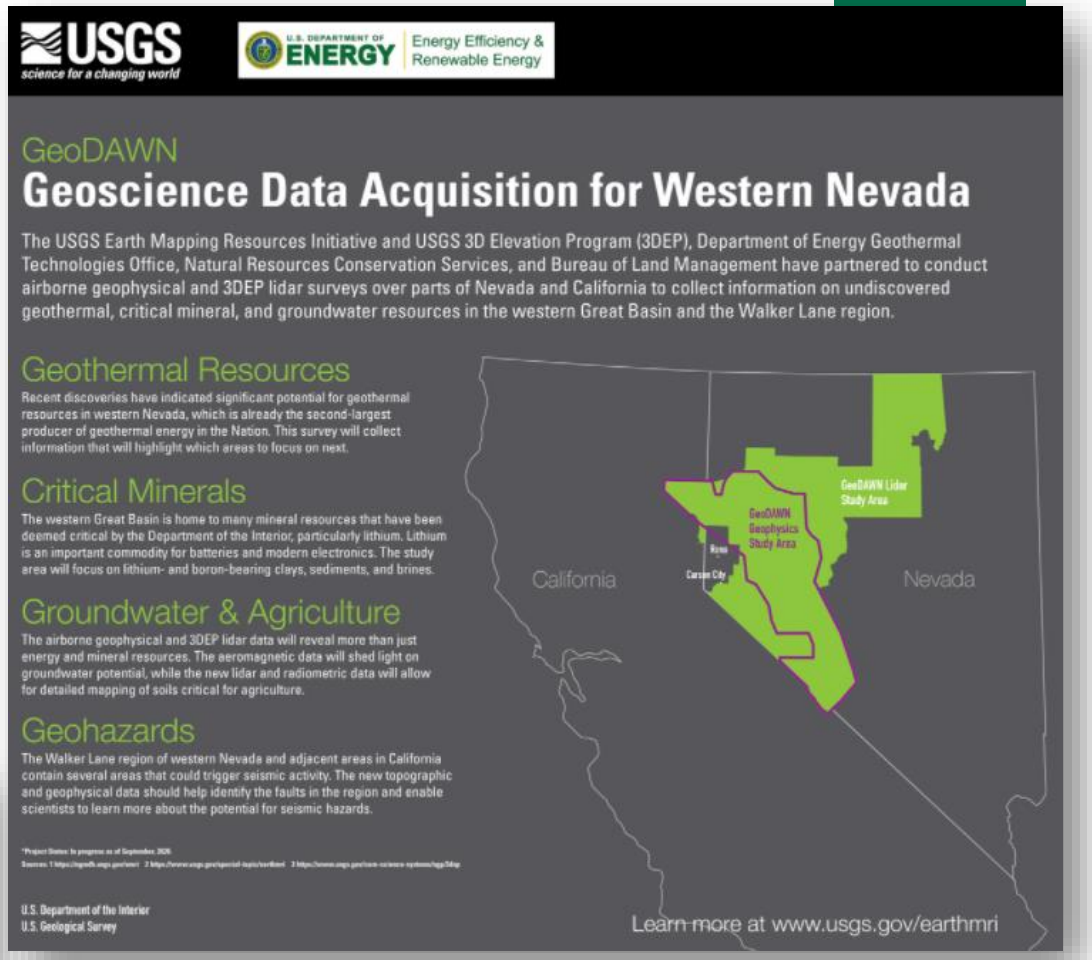
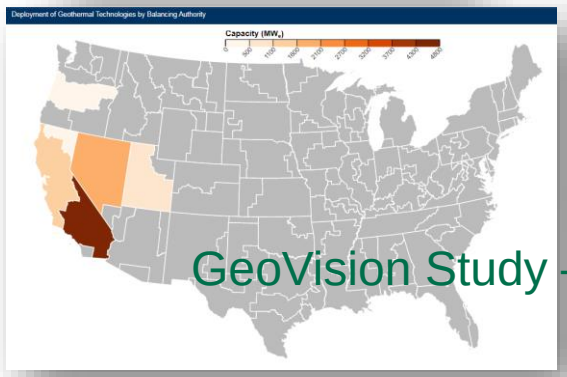
Critical Minerals and Energy Collaboration

- FY20 GeoDAWN: Geoscience Data Acquisition for Western Nevada collaboration for lidar and aeromagnetic data collection
- FY21 collaboration focused on California's Imperial Valley and Salton Sea
  - DOE Geothermal Technologies Office
  - USGS EarthMRI, Earthquake Hazards Program and 3DEP
  - BLM
  - NRCS
  - In collaboration with California Energy Commission and Department of Conservation
- Potential future collaboration for areas of undiscovered hydrothermal





GeoVision Study – Undiscovered Hydrothermal
https://openei.org/apps/geovision/

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Over 300 3DEP partners including 18 Federal agencies and >250 state and local governments

(Partial listing)

Bureau of Indian Affairs
Bureau of Land Management
DOD - AZ National Guard
Department of Energy
Federal Emergency Management Agency
Fish and Wildlife Service
National Geospatial-Intelligence Agency
National Oceanic and Atmospheric Agency
National Park Service
Natural Resources Conservation Service
Tennessee Valley Authority
U.S. Navy
US Army Corps of Engineers
US Bureau of Reclamation
USDA-ARS
US Forest Service
USGS
AK Dept. of Natural Res.
AK North Slope Borough
City of Gustavus
Fairbanks North Star Borough
Golden Valley Electric Authority
Matanuska
Metlakatla
Municipality of Anchorage
Organized Village of Kake
Sealaska
The Nature Conservancy
AL Department of Economic and Community Affairs
AL Department of Transportation
Chilton County, AL
Cullman County, AL
Franklin County, AL
Huntsville, City of
Russell County, AL
Town of Thorsby, AL
Tuscaloosa County, AL
Walker County, AL
AR Game and Fish Commission
Northwest AR Regional Planning Commission
Pulaski County Area GIS, AR
Coconino County, AZ
Pima Association of Governments, AZ
C A Department of Water Resources
CA Geological Survey
CA Natural Resource Agency
CalFire
City of San Diego OHS, CA
Los Angeles Regional Imagery Consortium, CA
San Diego County, CA
San Diego Association of Governments, CA
Southwest Wetlands Interpretive Association
City of Montrose, CO
CO Division of Rec and Mining
CO Governor's Office of Information Technology
CO Water Conservation Board
Denver International Airport
Garfield County, CO
Gunnison County, CO
Town of Castle Rock, CO
FL Division of Emergency Management
State of FL
Martin County Engineering Dept., FL
Northwest Florida Water Management District
Osceola County, FL Office of Emergency Management
Palm Beach County, FL
Seminole Tribe of Florida
St. Johns River Water Management District
Suwannee River Water Management District
City of Roswell, GA
GA Coastal Regional Commission
GA Environmental Protection Division
GA Mountains Regional Commission
IA Department of Agriculture and Land Stewardship
Nez Perce County, ID
Cook County, IL
IL Champaign County GIS Consortium
IL Department of Natural Resources
IL State Geological Survey
Kane County, IL
Lake County, IL
McHenry County, IL
Marion County GIS, IN
Hamilton County, IN
Wayne County, IN
KS Department of Agriculture
KS GIS Policy Board
KY Commonwealth Office of Technology
KY Division of Water
LA Coastal Protection and Restoration Authority
LA Department of Transportation and Development
Arlington, MA
State of MA
MassGIS
Baxter State Park, ME
Bureau of Parks and Lands, ME
Clayton Lake Woodland Holdings, LLC
Cooperative Forestry Research Unit. ME
Drinking Water Commission, ME
King Pine Win, ME
ME Bureau of Parks and Lands
ME Department of Transportation
ME Office of Information Technology
Seven Islands Land Company
Washington County, ME
Charlevoix County, MI
Gratiot County, MI Drain Commission
Little Traverse Bay Band Odawa Indians
The Southeast Michigan Council of Governments
State of MI
Boone County MO
Metropolitan St Louis Sewer District
MS Environmental Quality Department
NC Department of Transportation
NC Department of Public Safety
NC Floodplain Mapping Program
City of Blair, NE
City of Fremont, NE
City of Lincoln-Lancaster County, NE
City of Omaha, NE
Douglas County, NE
NE Office of the Chief Information Officer
Papio Missouri River Natural Resources District
Sarpy County, NE
NH Department of Environmental Services
NH Department of Transportation
NJ Department of Environmental Protection
DE Valley Regional Planning Commission
City of Henderson, NV
City of Las Vegas, NV
Clark County Regional Flood, NV
Clark County Water Reclamation District, NV
Clark County, NV
Lyon County, NV
Southern NV Water Authority
Storey County, NV
University of Nevada Reno
Washoe County, NV
City of Buffalo, NY
International Joint Commission (IJC)
NY State Information Technology Services
NY State Office of Information Technology Services
City of Columbus OH
Clinton County OH
Delaware County OH
Lucas County, OH
Muskingum Watershed Conservancy District
OH Department of Administrative Services
Sandusky County, OH
Wood County, OH
City of Hillsboro, OR
City of Portland, OR
Coquille Indian Tribe
Metro Regional Gov, OR
OR Department of Geology and Mineral Industries
OR Water Enhancement Board Grant
OR Department of Forestry
Umatilla Indian Reservation
City of Allentown, PA
PA Turnpike Commission
PA Department of Environmental Protection
PA Department of Transportation
PA Dept of Conservation and Natural Resources
PA Emergency Management Agency
Susquehanna River Basin Commission
Tri-County Regional Planning Commission, PA
Puerto Rico Planning Board
Aiken County, SC
Anderson County, SC
Beaufort County, SC
Charleston County, SC
City of Aiken, SC
City of Greenville, SC
City of North Augusta, SC
Dorchester County, SC
Jasper County, SC
Lexington County, SC
Newberry County, SC
Pickens County, SC
Richland County, SC
SCANA Public Utility, SC
South Carolina Lidar Consortium
911, TN
Appalachian Electric Co-op, TN
Arlington, TN
City of Bartlett, TN
City of Bristol, TN
City of Kingsport, TN
City of Germantown, TN
Hamilton County, TN
Johnson City Metro Transportation Planning Organization, TN
City of Lakeland, TN
Memphis Chamber of Commerce
Memphis Light, Gas and Water
City of Memphis, TN
Metropolitan Planning Department
Nashville Davidson County
City of Millington, TN
Morristown-Hamblen GIS Group
Rutherford County, TN
Shelby County, TN
Sullivan County, TN
TN Department of Finance and Administration
Town of Collierville, TN
Houston-Galveston Area Council
San Antonio River Authority
TX Commission on Environmental Quality
TX Water Development Board
Williamson County
UT Division of Emergency Management
UT Geological Survey
UT Forestry, Fire, and State Lands
Moab City, UT
Wasatch Ski Resorts
Tooele Army Depot
Bryce Canyon History
Riverdale City, UT
Park City, UT
Mohave County, UT
Bear Lake Watch
City of Tremonton, UT
City of Logan, UT
City of Brigham, UT
Fairfax County, VA
Henrico County, VA
University of Virginia
VA Dept of Environmental Quality
VA Information Technologies Agency
City of Williamsburg, VA
VT Agency of Commerce and Community Development
Columbia County
WA Dept of Natural Resources
Adams County, WI
Bayfield County, WI
Calumet County, WI
Clark County, WI
Dane County, WI
Dodge County, WI
Fond du Lac County, WI
Forest County, WI
Green Lake County, WI
Jefferson County, WI
La Crosse County, WI
Lafayette County, WI
Langlade County, WI
Lincoln County, WI
Monroe County, WI
Oneida County WI Land Information
Pepin County, WI
Portage County, WI
Price County, WI
Sawyer County, WI
Southeastern Wisconsin Regional Planning Commission
Taylor County, WI
City of Washburn
Waupaca County, WI
Winnebago County, WI
Wisconsin Coastal Management Program
Illinois Height Modernization Program
MI Dept of Environmental Quality
MI Department of Technology, Management and Budget
Natrona County, WY
Capitol Region Council of Governments
County of Hawaii
Waushara County, WI

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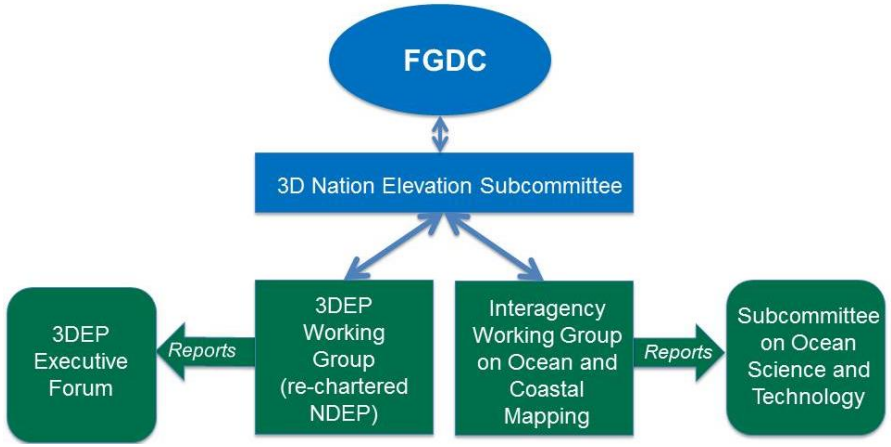
3D Elevation Program (3DEP)

Governance

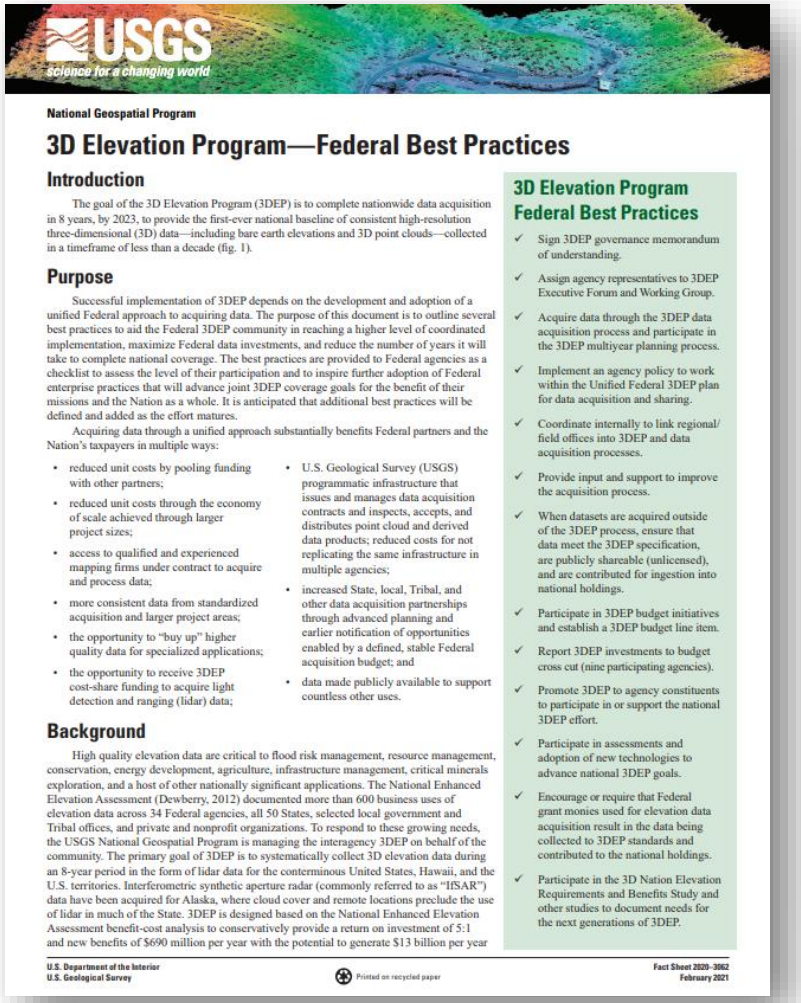
- USGS and NOAA co-lead the OMB A-16 Elevation Theme
- 3DEP Executive Forum
  - Facilitates executive collaboration on strategies to fund and implement 3DEP for the benefit of all its stakeholders
  - Executive Outreach to Industry Partners and Stakeholder Groups
  - Provides direction to 3DEP Working Group
- 3DEP Working Group - Coordinates implementation of 3DEP



Member Agencies
Bureau of Land Management
Department of Homeland Security
Department of Transportation
Environmental Protection Agency
Federal Aviation Administration
Federal Communications Commission
Federal Emergency Management Agency
US Forest Service
US Fish and Wildlife Service
National Oceanic and Atmospheric Administration
National Park Service
Natural Resources Conservation Service
Office of Surface Mining Reclamation and Enforcement
US Department of Agriculture
US Army Corps of Engineers
US Geological Survey
American Association of State Geologists
National States Geographic Information Council

Accelerating the 3DEP Unified Plan

Refining and Strengthening Federal and State Best Practices



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National Geospatial Program

3D Elevation Program—Federal Best Practices

Introduction

The goal of the 3D Elevation Program (3DEP) is to complete nationwide data acquisition in 8 years, by 2023, to provide the first-ever national baseline of consistent high-resolution three-dimensional (3D) data—including bare earth elevations and 3D point clouds—collected in a timeframe of less than a decade (fig. 1).

Purpose

Successful implementation of 3DEP depends on the development and adoption of a unified Federal approach to acquiring data. The purpose of this document is to outline several best practices to aid the Federal 3DEP community in reaching a higher level of coordinated implementation, maximize Federal data investments, and reduce the number of years it will take to complete national coverage. The best practices are provided to Federal agencies as a checklist to assess the level of their participation and to inspire further adoption of Federal enterprise practices that will advance joint 3DEP coverage goals for the benefit of their missions and the Nation as a whole. It is anticipated that additional best practices will be defined and added as the effort matures.

Acquiring data through a unified approach substantially benefits Federal partners and the Nation's taxpayers in multiple ways:

- reduced unit costs by pooling funding with other partners;
- reduced unit costs through the economy of scale achieved through larger project sizes;
- access to qualified and experienced mapping firms under contract to acquire and process data;
- more consistent data from standardized acquisition and larger project areas;
- the opportunity to "buy up" higher quality data for specialized applications;
- the opportunity to receive 3DEP cost-share funding to acquire light detection and ranging (lidar) data;
- U.S. Geological Survey (USGS) programmatic infrastructure that issues and manages data acquisition contracts and inspects, accepts, and distributes point cloud and derived data products; reduced costs for not replicating the same infrastructure in multiple agencies;
- increased State, local, Tribal, and other data acquisition partnerships through advanced planning and earlier notification of opportunities enabled by a defined, stable Federal acquisition budget; and
- data made publicly available to support countless other uses.

Background

High quality elevation data are critical to flood risk management, resource management, conservation, energy development, agriculture, infrastructure management, critical minerals exploration, and a host of other nationally significant applications. The National Enhanced Elevation Assessment (Dewberry, 2012) documented more than 600 business uses of elevation data across 34 Federal agencies, all 50 States, selected local government and Tribal offices, and private and nonprofit organizations. To respond to these growing needs, the USGS National Geospatial Program is managing the interagency 3DEP on behalf of the community. The primary goal of 3DEP is to systematically collect 3D elevation data during an 8-year period in the form of lidar data for the conterminous United States, Hawaii, and the U.S. territories. Interferometric synthetic aperture radar (commonly referred to as "IfSAR") data have been acquired for Alaska, where cloud cover and remote locations preclude the use of lidar in much of the State. 3DEP is designed based on the National Enhanced Elevation Assessment benefit-cost analysis to conservatively provide a return on investment of 5:1 and new benefits of $690 million per year with the potential to generate $13 billion per year

3D Elevation Program Federal Best Practices

- ✓ Sign 3DEP governance memorandum of understanding.
- ✓ Assign agency representatives to 3DEP Executive Forum and Working Group.
- ✓ Acquire data through the 3DEP data acquisition process and participate in the 3DEP multiyear planning process.
- ✓ Implement an agency policy to work within the Unified Federal 3DEP plan for data acquisition and sharing.
- ✓ Coordinate internally to link regional/field offices into 3DEP and data acquisition processes.
- ✓ Provide input and support to improve the acquisition process.
- ✓ When datasets are acquired outside of the 3DEP process, ensure that data meet the 3DEP specification, are publicly shareable (unlicensed), and are contributed for ingestion into national holdings.
- ✓ Participate in 3DEP budget initiatives and establish a 3DEP budget line item.
- ✓ Report 3DEP investments to budget cross cut (nine participating agencies).
- ✓ Promote 3DEP to agency constituents to participate in or support the national 3DEP effort.
- ✓ Participate in assessments and adoption of new technologies to advance national 3DEP goals.
- ✓ Encourage or require that Federal grant monies used for elevation data acquisition result in the data being collected to 3DEP standards and contributed to the national holdings.
- ✓ Participate in the 3D Nation Elevation Requirements and Benefits Study and other studies to document needs for the next generations of 3DEP.

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U.S. Geological Survey
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Fact Sheet 2020–3062
February 2021

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National Landslides Preparedness Act (P.L. 116-323)

Authorizes the 3D Elevation Program and Establishes Governance

- In addition to the 3DEP Subcommittee under NGAC, the act stablishes a 3DEP Federal Interagency Coordinating Committee, chaired by the Secretary of the Interior in coordination with the Secretary of Commerce and the Secretary of Homeland Security including:
  - Agriculture
  - Commerce
  - Homeland Security
  - National Science Foundation
  - Office of Science and Technology Policy
  - Office of Management and Budget
  - The head of any other Federal department or agency, at the request of the Secretary
- Within a year, the coordinating committee will develop a strategic plan and a management plan to implement the strategic plan

National Landslides Preparedness Act (P.L. 116-323)

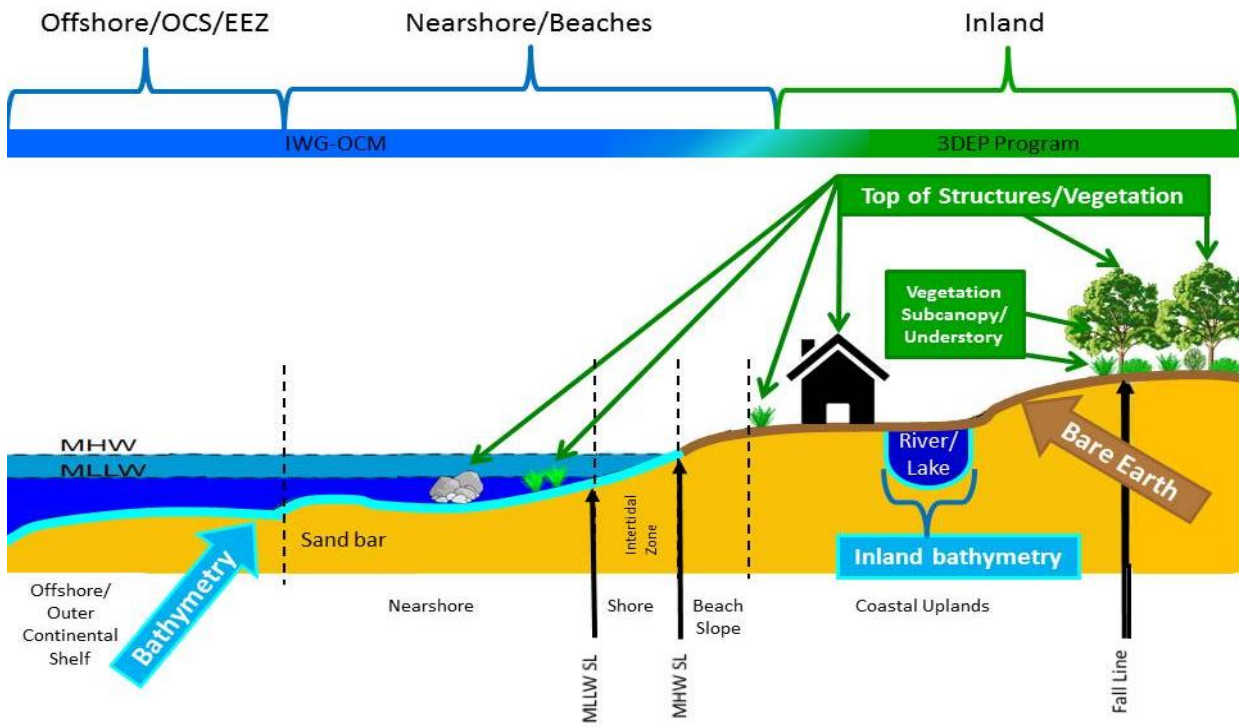
Goals for 3DEP FICC and NGAC Subcommittee

- Merge/evolve 3DEP Executive Forum with/to the FICC; ensure that the 3DEP Working Group is linked in
- Encourage engagement at highest levels of DOI, DHS and DOC and listed agencies; invite new agencies to participate
- Evolve towards broader coordination for the future direction of the 3D National Topography Model (3DNTM)
- Potential topics for both groups
  - New applications, partnerships
  - Funding
    - What creative funding options should we be looking at to complete nationwide coverage?
    - How can we fund completion of Federal lands where the agencies do not have 3DEP funding?
  - Feedback on products and services delivery
  - Future directions
    - Input on the 3D National Topography Model
    - Recommendations on research and future implementation of the 3D data model

3DEP Future Generation Just Around the Corner

3D Nation Elevation Requirements and Benefits Study

- Working with NOAA to understand inland, nearshore and offshore bathymetric data requirements and benefits
- Plan for the next round of 3DEP when the first-ever national baseline of consistent high-resolution data is in place – what is needed for monitoring, change detection and other new applications?
- Gather technology-agnostic user information to be able to assess new technologies against requirements and identify the tradeoffs between different approaches
- **Results will lead to a completely new approach regarding QLs, refresh frequency by geography, products offered, and other changes**



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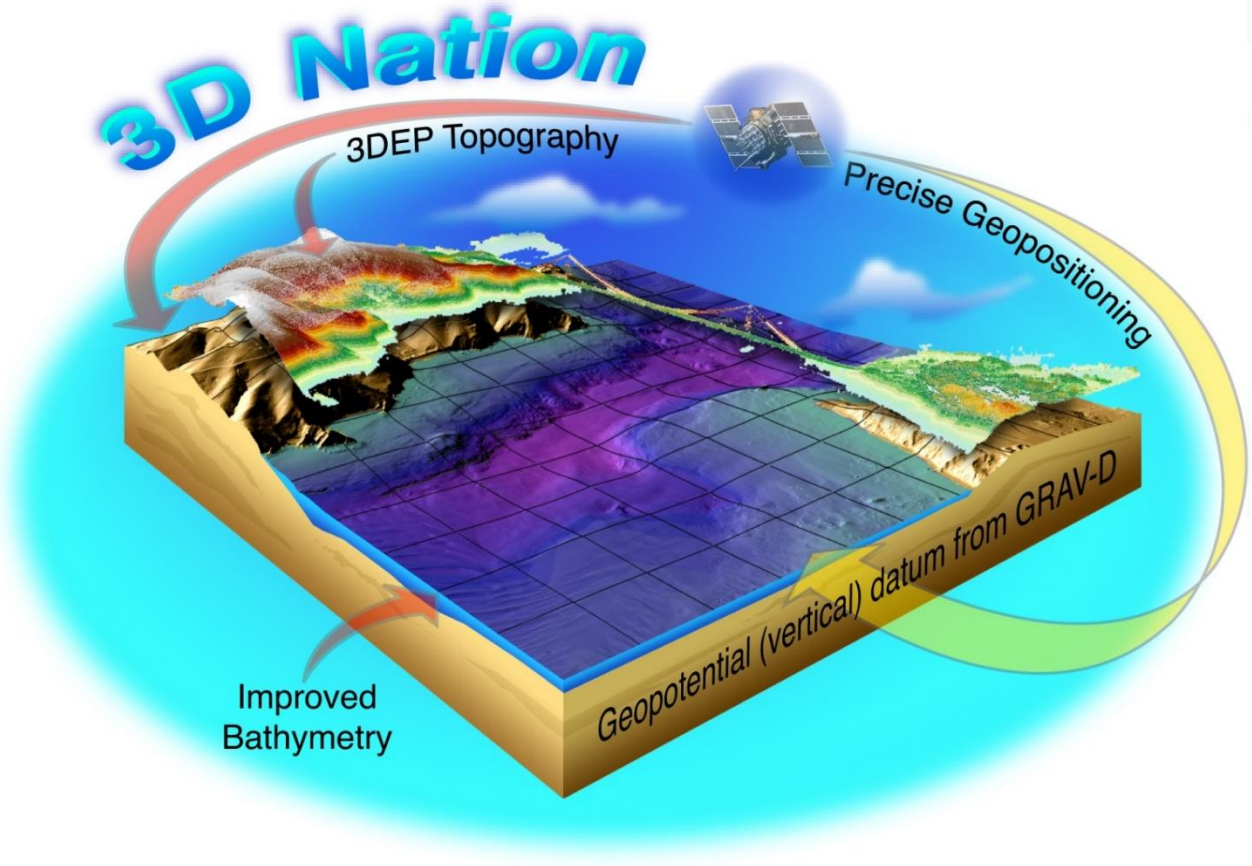
3D Nation

Building a modern elevation foundation – from the peaks of our mountains to the depths of our waters – for stronger, more resilient communities and U.S. economy

- To be relevant in the 21st century accurate 3D maps are a requirement for a GPS-enabled Nation
- Maps, including geodetic and elevation data, must be accurate to within centimeters
- A national mapping framework must be continuous
- Our citizens increasingly expect coordinated and integrated products



USGS science for a changing world

The National Map
Your Source for Topographic Information

NOAA
National Oceanic and Atmospheric Administration
U.S. Department of Commerce

3DNTM: Next Generation of Integrated Data

Topography is defined by elevation and hydrography; elevation shapes hydrography, and hydrography shapes elevation. To support a broad range of applications, the **3D National Topography Model** integrates USGS elevation and hydrography datasets to model the Nation's topography in 3D.

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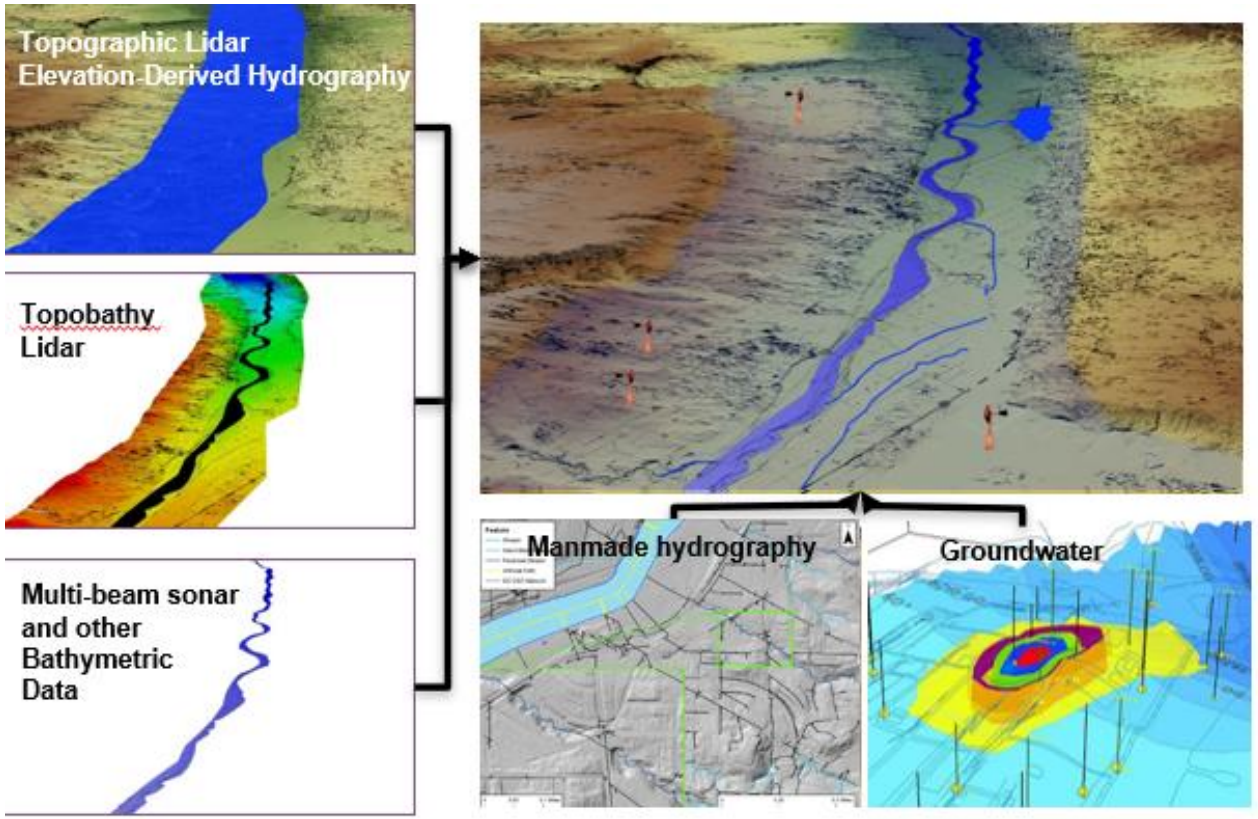

Next Generation NHD: 3D Hydrography Program (3DHP)

- Operationalize **deriving hydrography from lidar/IfSAR**
- Enable better accounting of the hydrologic cycle by adding **connections to groundwater, engineered hydrologic systems and wetlands**
- Fully implement the **National Hydrography Infrastructure** as the universal mechanism for sharing and discovering water information

Next Generation 3D Elevation Program (3DEP)

- Operationalize **inland bathymetry**
- Collect new data based on **landscape change, evolving user needs and technology, vegetation structure**
- Enable **monitoring and change detection** by comparing baseline with new vintages of data

3DNTM: Supports the Nation's Critical Applications

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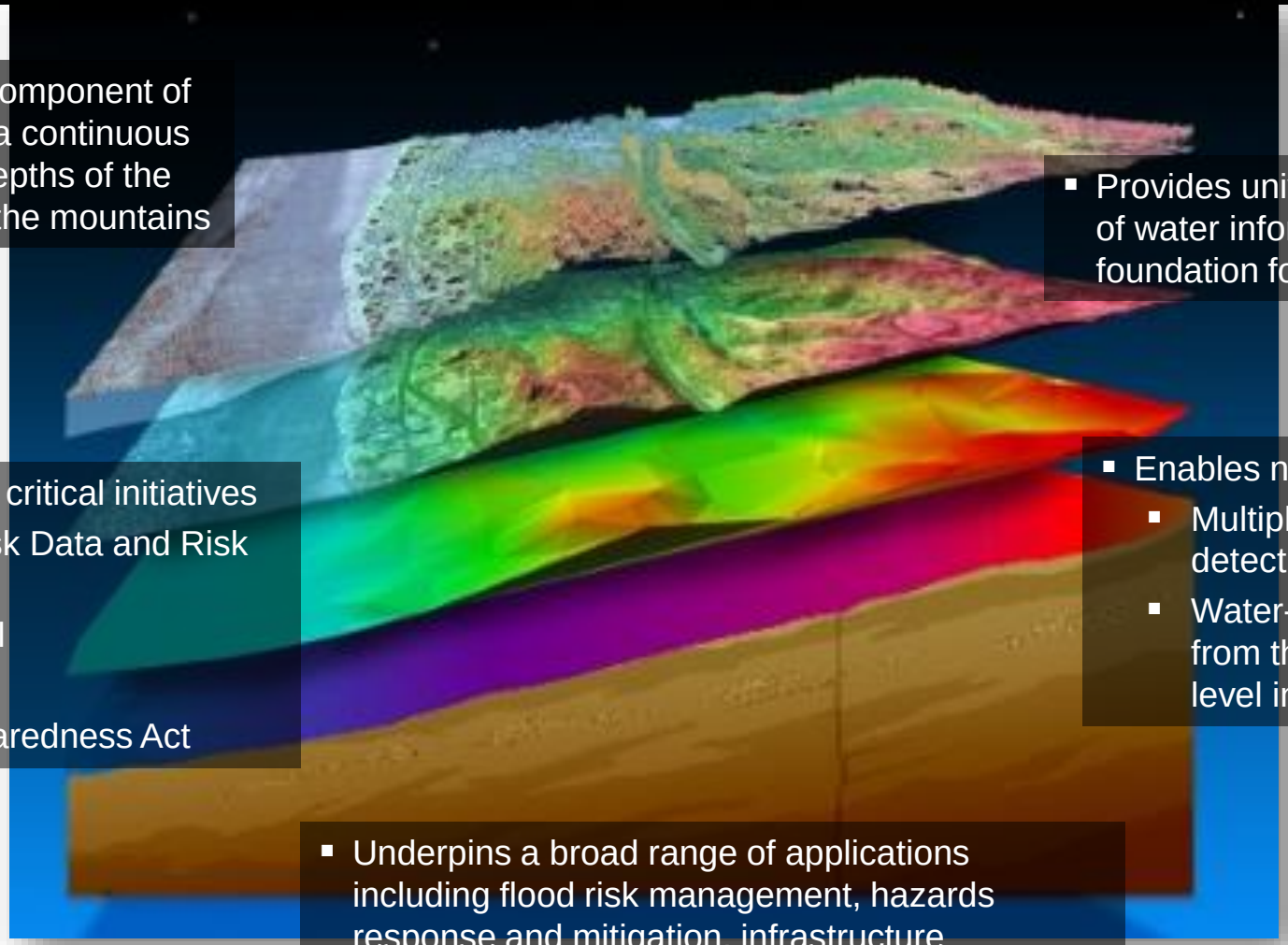

- Delivers the terrestrial component of the 3D Nation vision of a continuous data surface from the depths of the oceans to the peaks of the mountains
- Provides universal discovery and sharing of water information as the geospatial foundation for the Internet of Water
- Provides foundational data to critical initiatives
  - FEMA Future of Flood Risk Data and Risk Rating 2.0
  - The National Water Model
  - The Clean Water Act
  - National Landslides Preparedness Act
- Enables new and emerging applications
  - Multiple vintages enable change detection
  - Water-related applications move from the neighborhood to the street-level in accuracy
- Underpins a broad range of applications including flood risk management, hazards response and mitigation, infrastructure management, climate change science, and more

USGS science for a changing world

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Bismarck, ND
3D Elevation Program (3DEP)